UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,633	08/26/2005	Christopher John Howard Wort	266485US6PCT	1368

22850 7590 03/18/2011

OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
MILLER, DANIEL H	
ART UNIT	PAPER NUMBER
1783	

NOTIFICATION DATE	DELIVERY MODE
03/18/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No.	Applicant(s)	
	10/529,633	WORT ET AL.	
	Examiner	Art Unit	
	DANIEL MILLER	1783	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/29/2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *39-45 and 47-80* is/are pending in the application.

4a) Of the above claim(s) *57-77* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *39-45,47-56 and 78-80* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 39-45, and 47-56, 78-80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imai et al (US 5,499,601).

3. Imai teaches a resultant metal/diamond composite base material (substrate, column 8 lines 33-60). The material can be formed by floating the diamond to the top of the molten metal to orient the diamond seed crystals prior to solidifying the metal matrix or by cutting along a crystal plane (to expose the diamond particles or crystals to the surface), which is necessary for growing the diamond. As shown in FIG. 6, the diamond particles are exposed by removing a part of the metal at a surface, for example, by means of an acid (column 8 lines 33-60). As shown in FIG. 7, the diamond is grown by using the exposed diamond particles as seed crystals by the vapor phase synthesis (CVD) method (column 8 lines 33-60). Since the seed crystals have the aligned crystal orientations, the grown diamond is a single crystal or a polycrystal having the aligned orientation (column 8 lines 33-60).

4. The metal matrix can comprise Cu (copper), or Cu alloys or Si, Al or Au alloys or mixtures of these (see examples).

5. Imai teaches that the diamonds are grown using epitaxial growth (see coulmn 4), but that it is difficult to form the diamond single crystal layer on the metal single crystal, even though a thin metal single crystal layer can be easily formed on the diamond single crystal, is because it seemed to be that the crystal orientation of the diamond easily disorders since very vigorous reactions are performed in the vapor phase synthesis of diamond (column 4 lines 40-55). Imai intends to provide alignment of crystal orientations of the diamond particles utilizing the property that the orientations of the diamond crystal and the metal crystal can easily align. Energy (column 4 lines 40-55).

6. The diamond particles are partially embedded into the surface of the substrate with diamond grains being exposed to the surface (figure 2). The examiner is considering the partially embedded diamond particles to be a (DL) material having “diamond particles in a matrix” and also having surface with exposed diamond particles as claimed. The diamond films are considered to be hole free and continuous to the extent to which applicant has defined the terms (see examples). The film is inherently “at least in part” bonded to the particles by epitaxy because the diamond film is formed on the diamond particles in a CVD process substantially similar to applicant’s process.

7. Imai is silent as to the percentage of diamonds particles making up the exposed surface or the grain size in relationship to the thickness of the CVD grown diamond layer.

8. Regarding the size of the diamond grains and the thickness of the CVD diamond layer, the diamond grains or particles of Imai are taught to be between 0.5 and 500 micrometers (column 5 lines 10-20) while exemplary thicknesses of the CVD diamond layer are taught at 50 micrometers (see example 1 and 2); it would have been obvious to one of ordinary skill to provide a thicknesses of the CVD layer and size of the diamond particles within the disclosed overlapping range to that claimed range including a diamond particles being four times the thickness of the CVD diamond layer thickness.

9. It would further have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the percentage of exposed surface in contact with diamond grains, as well as grain size and in so doing provide greater than 30% or greater than 70% exposed surface epitaxy of the DL/ CVD layer interface since Amai teaches it is necessary to expose the diamond surface in order to grow the single or polycrystalline diamond layer and that it is preferred for them to be floated to the top and oriented with the crystal structure of the molten metal, therefore one of ordinary skill would be motivated to provide optimal diamond nucleation sites (and would look to larger diamond grains within the disclosed range) in order to grow a high quality well adhered, well ordered crystal structures (see background) CVD diamond films that cover the entire surface of the substrate of Imai and don't peel off do to good adhesion to the substrate (wherein the non diamond substrate of Imai won't grow well ordered diamond). No patentable distinction is seen.

10. It has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

11. Regarding claim 54, the material of Imai is used as a device with high thermal conductivity (see column 1 lines 15-20), therefore it would have been obvious to provide the structure claimed by applicant wherein the two opposing sides having the diamond film taught by Zhu in order to interface as a heat spreader with two opposing surfaces (i.e. A heat source and a heat transfer device) as is common in thermal interface system known in the art.

12. Regarding claims 55 and 56, the particles incorporated into the metal matrix and are part of the surface of the substrate (as in figure 1-9) is considered to result in deliberately enhanced epitaxy bonding.

13. Regarding claims 78-80, the material of Imai is used as a device with high thermal conductivity (see column 1 lines 15-20), such as a heat spreader and would meet the claim limitations or in the alternative would be obvious to provide given the diameter of the particles of diamond material and the structural limitations of the material.

Response to Arguments

14. Applicant's arguments filed 12/29/2010 have been fully considered but they are not persuasive.

15. Applicant's full arguments have been carefully considered. However, Attorney and/or representative arguments are not evidence on the record are not considered evidence on the record to be reasonably relied upon. Applicant has submitted no supportive evidence to support the claim that Silicon, even though disclosed in the reference, would not be a suitable matrix material. Further, even if attorney arguments are agreed to by the Examiner, the formation of carbides in the silicon would still read on applicant's claimed invention. No patentable distinction is seen.

16. Rejection maintained.

Conclusion

17. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL MILLER whose telephone number is (571)272-1534. The examiner can normally be reached on M-Th.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Keith Hendricks can be reached on (571)272-1376. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David R. Sample/
Supervisory Patent Examiner, Art Unit 1783

/Daniel Miller/
Examiner, Art Unit 1783